Department of Statistics

MASTER'S THESIS PRESENTATION

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Distributionally Robust Wasserstein Profile Inference on Convex Objectives

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ABSTRACT

Robust Wasserstein Profile Inference (RWPI) is a theoretical tool to inference a size of uncertainty with high confidence in Distributionally Robust Optimization (DRO). Previous work has shown that the distributionally robust risk exhibits a dimension free $O(n^{-1/2})$ rate of convergence to the optimal risk for certain losses. To establish a step towards a general theory of RWPI, we provide an extension for optimal risk coverage of the robust risk to a broader class of loss functions. Particularly, we provide an analysis on the asymptotic risk coverage of excess robust risk when our objective function is smooth or concave in its observed samples. While previous works on Wasserstein profile inference have limited its applications on model parameter estimation, we further investigate this problem to a setting when a decision variable and a model parameter estimate from a vector autogressive process (VAR) is jointly of interest (e.g. portfolio optimization). Our analysis shows that a simple plug-in empirical estimator is sufficient to approximate the desired risk. Subsequently, we suggest a practical two-step algorithm that leverages this estimator using tractable reformulations. We provide experiments which corroborate our hypothesis.
